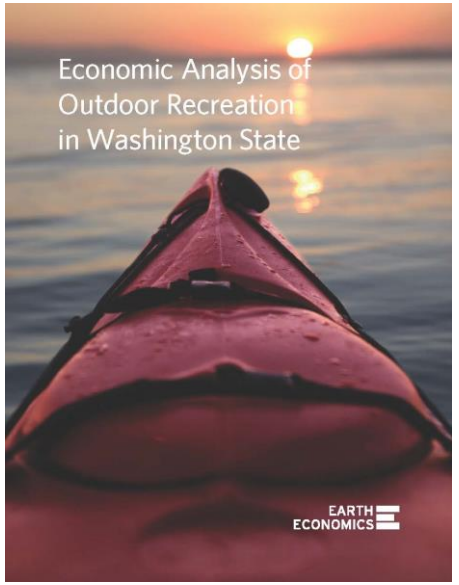
Making an Economic Case for Resilience

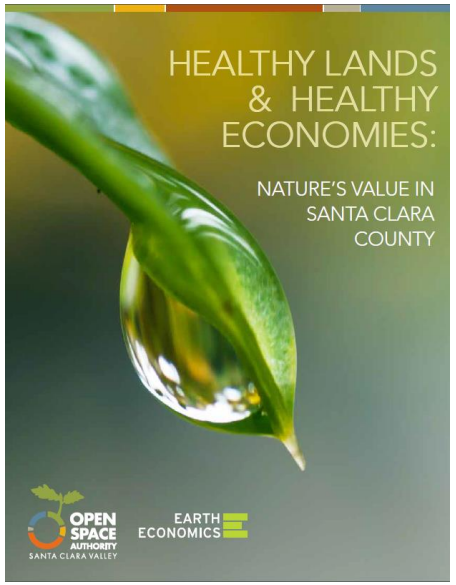
Practical Applications in California

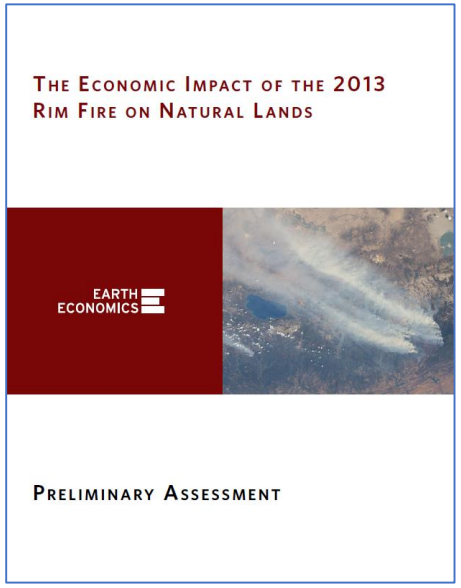
EARTH ECONOMICS

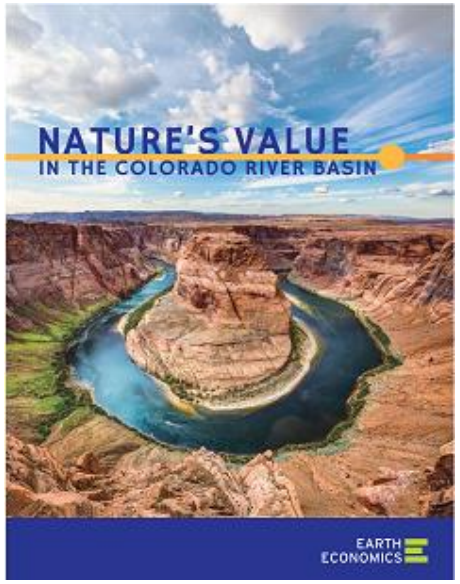
Earth Economics

- 501 (c)(3) non-profit
- Founded 1998
- 18 Staff

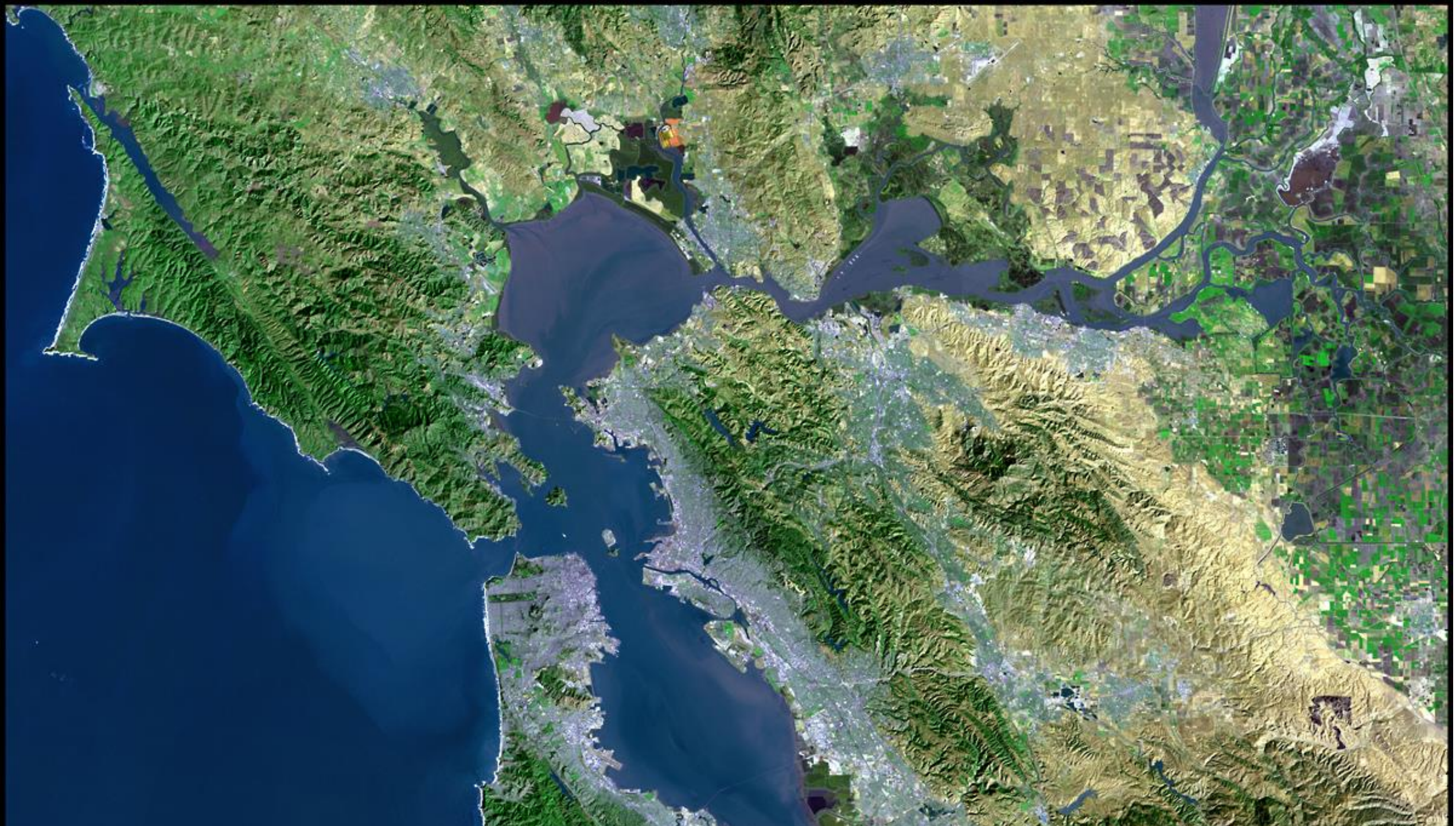






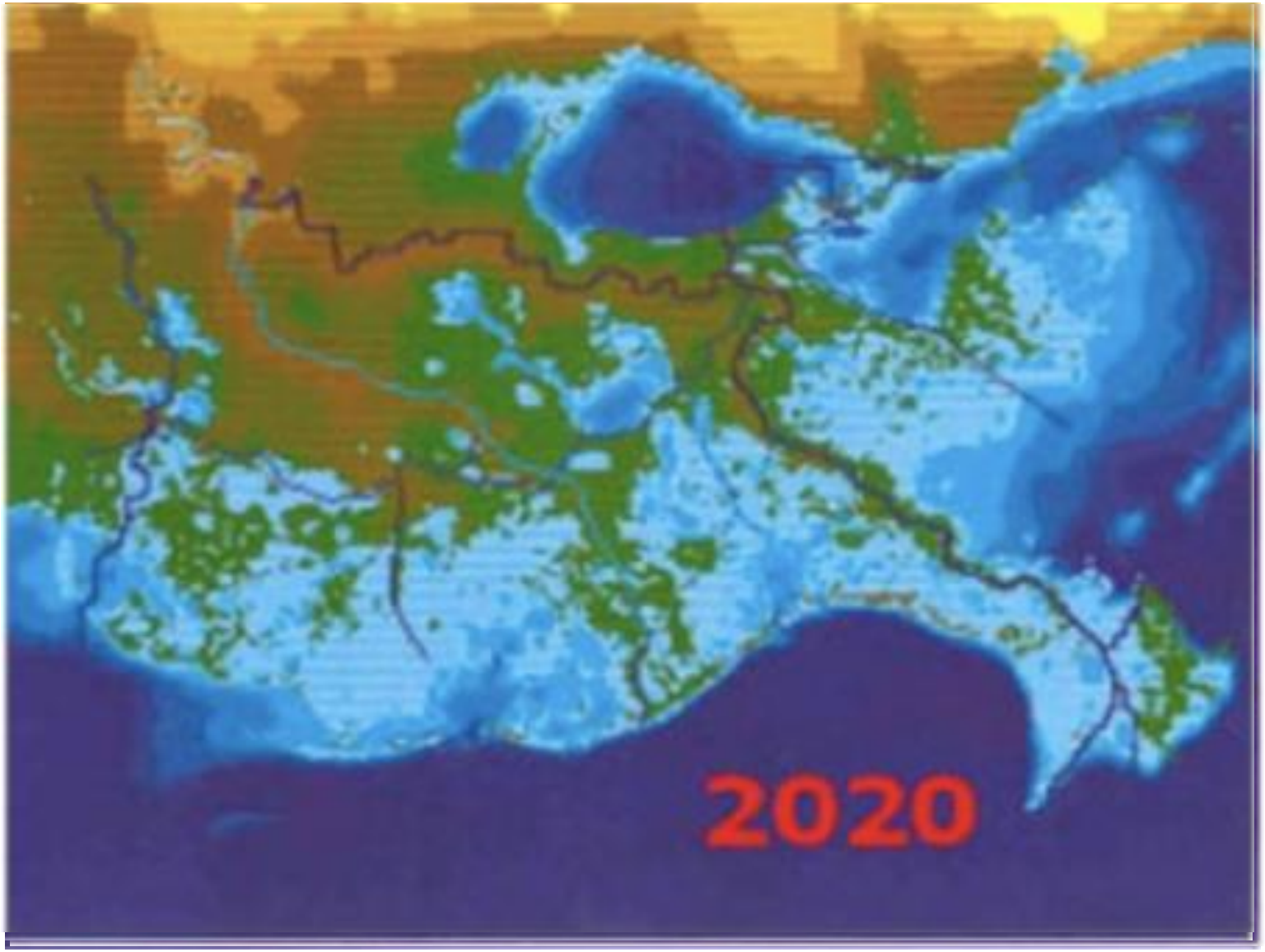



Economy
Environment

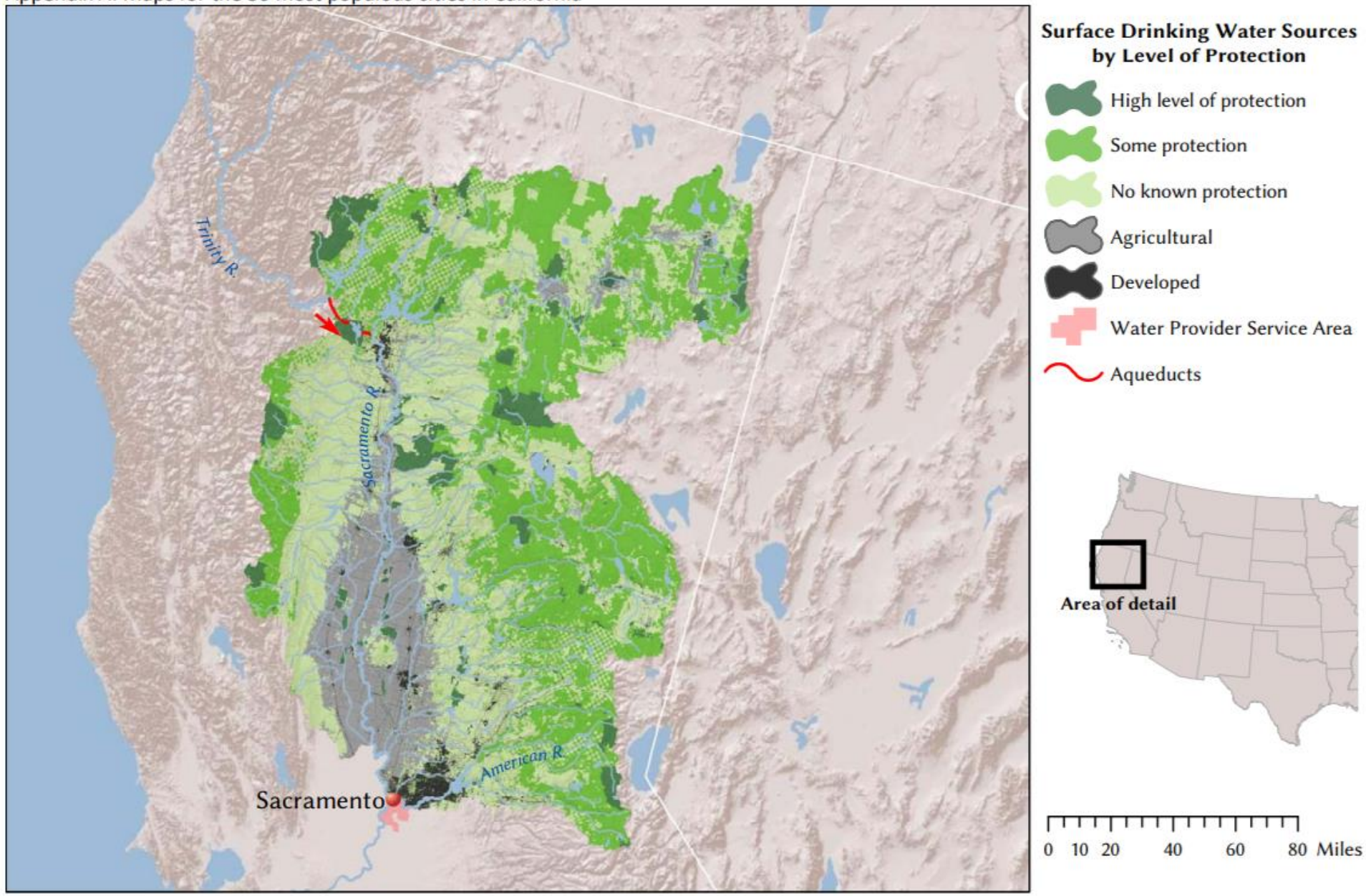


Natural Capital

Adds Real Economic Value



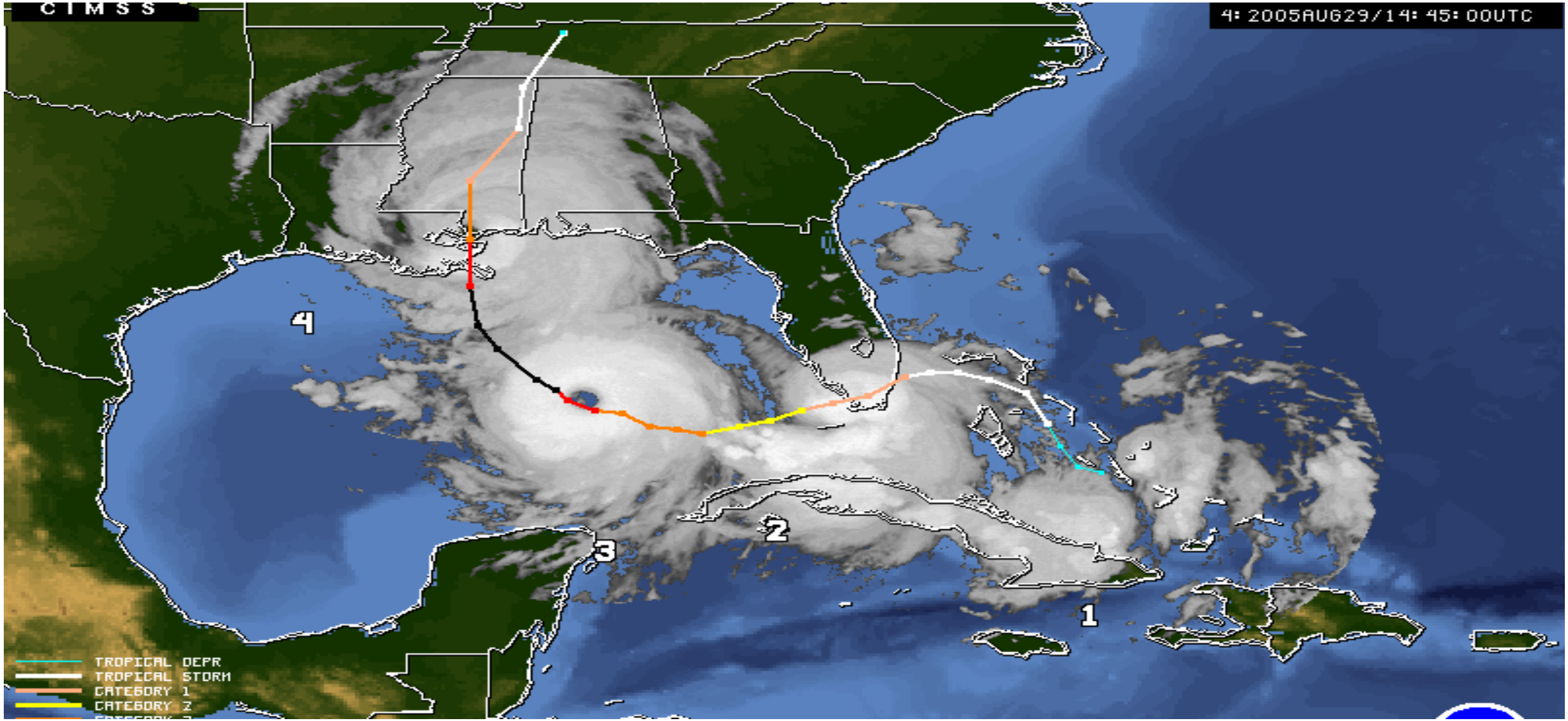
Appendix A: Maps for the 30 most populous cities in California



Surface Drinking Water Sources for Sacramento, CA

Map produced for The Nature Conservancy (TNC) 2012. TNC uses the most current and complete data available. GIS data and product accuracy may vary.
Areas delineated as having "No known protection" may include water district lands and easements on private lands.
Using GIS products for purposes other than those for which they were intended may yield inaccurate or misleading results.

The Nature Conservancy
Protecting nature. Preserving life.™

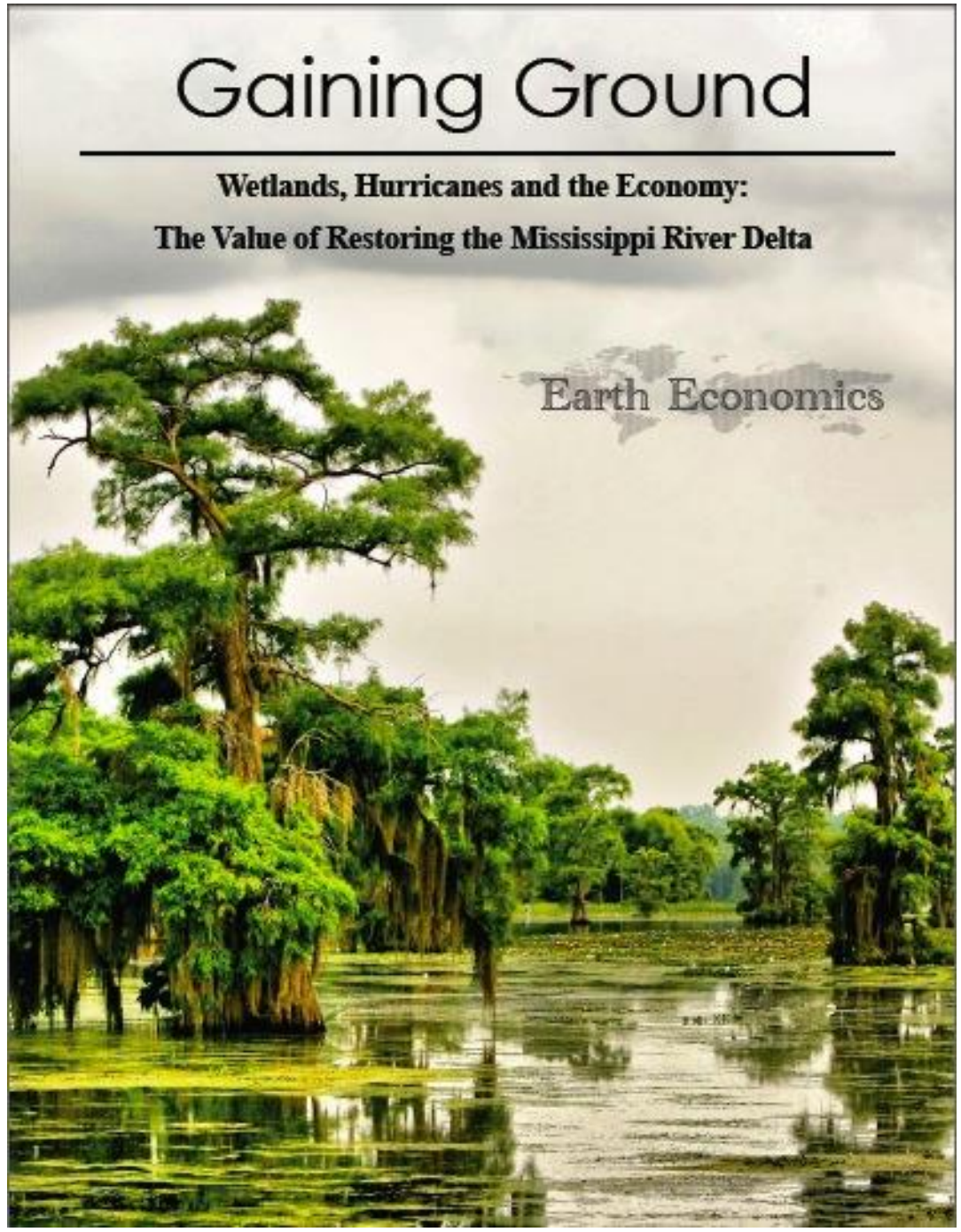

CIMSS
4: 2005AUG29/14:45:00UTC
4
3
2
1
TROPICAL DEPR
TROPICAL STORM
CATEGORY 1
CATEGORY 2


$200 Billion in Damages
1,600 People Died

Gaining Ground

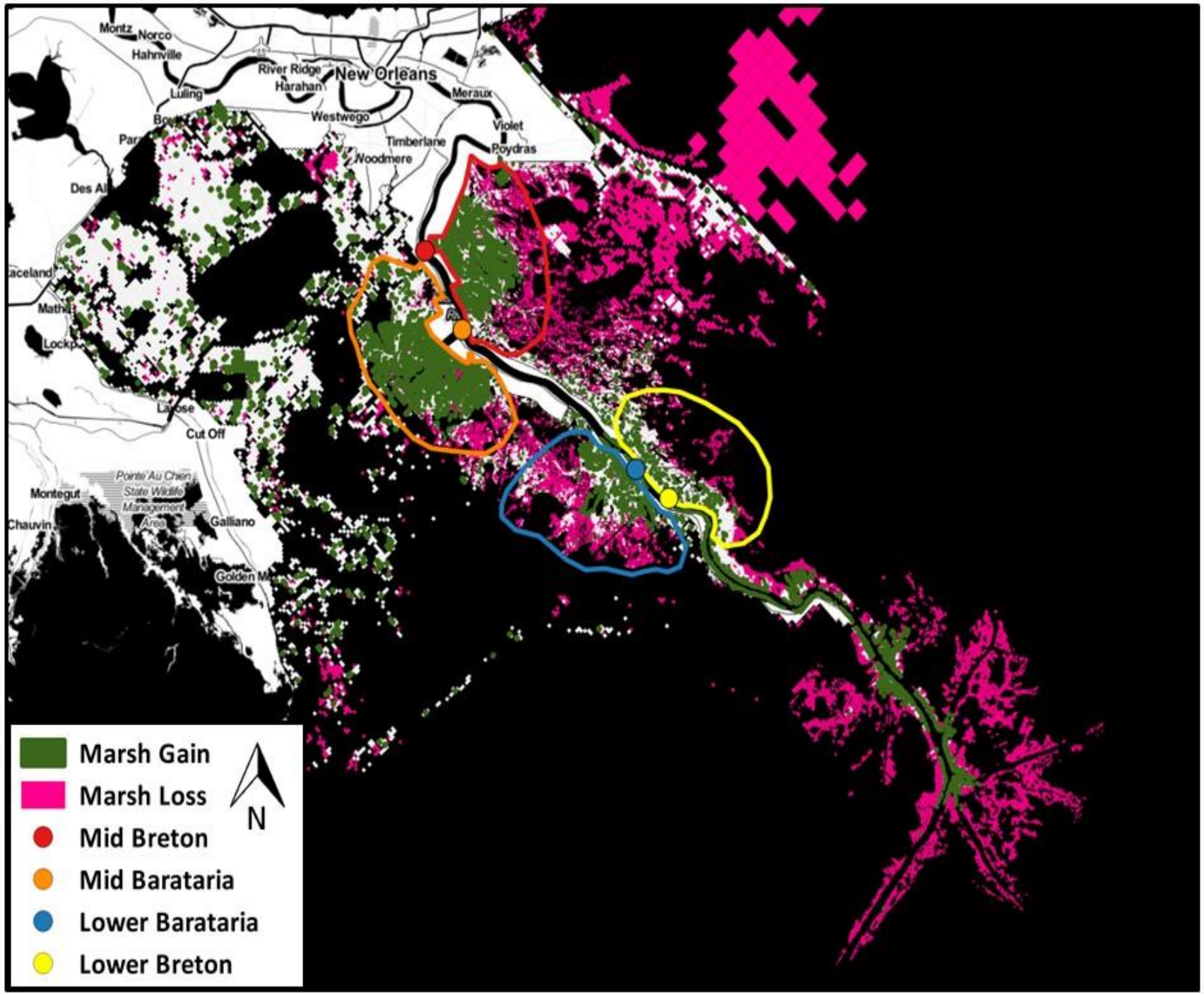
Wetlands, Hurricanes and the Economy:

The Value of Restoring the Mississippi River Delta

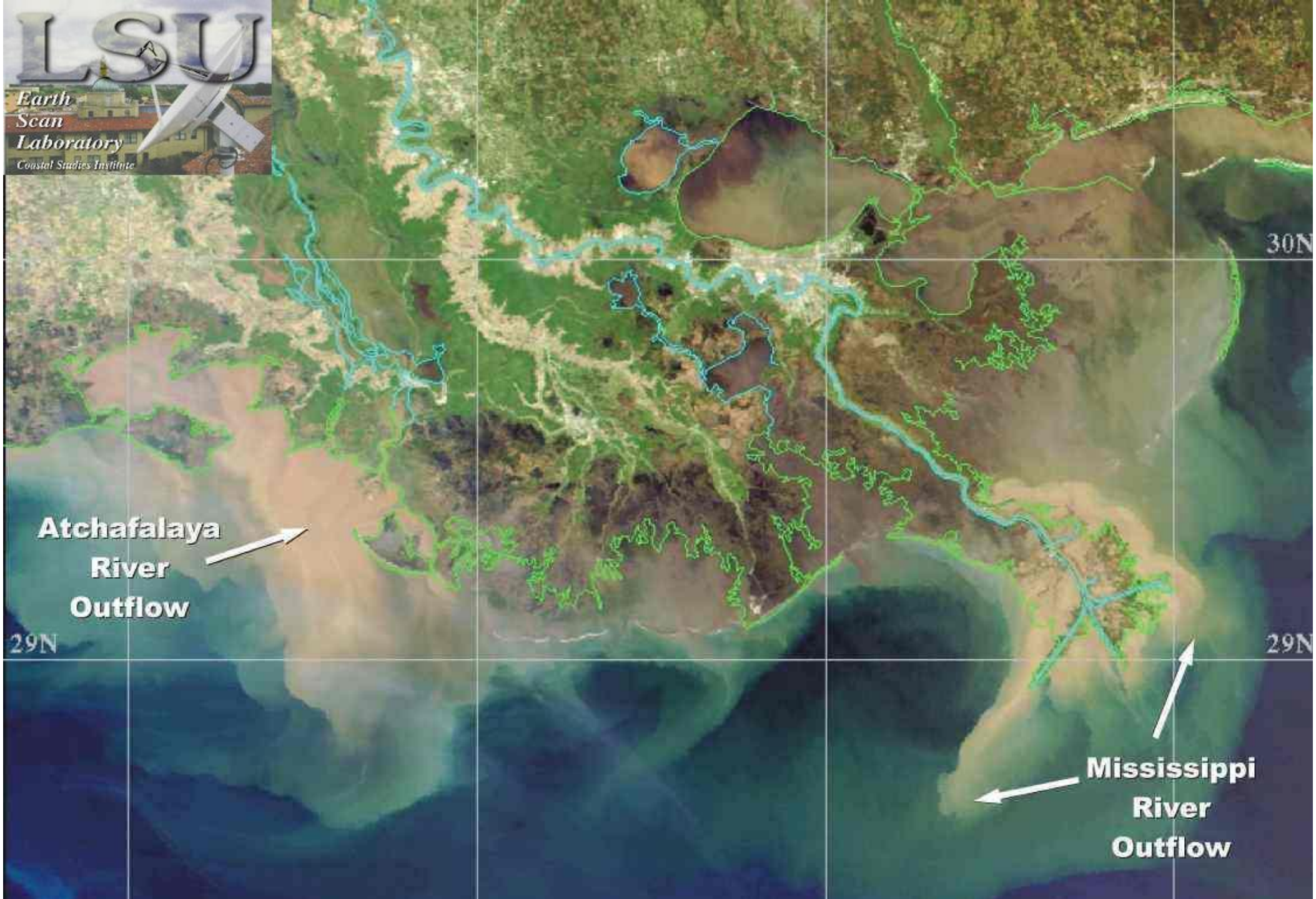


Earth Economics

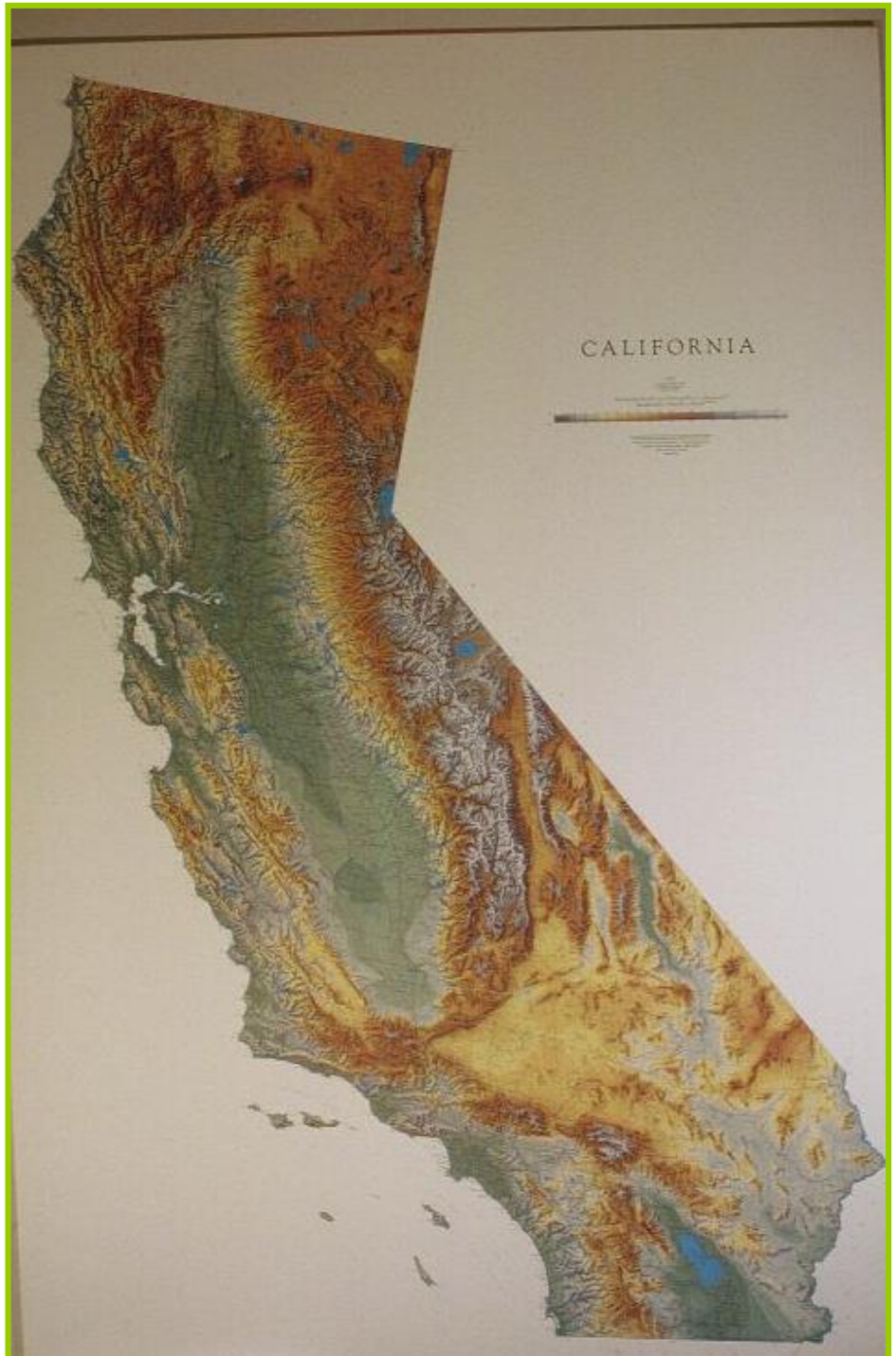
Vegetation density around at diversions in four diversions scenario at Year 50



CPRA $50 Billion Plan



The big picture



What's
of
value
Here?

Four Types of Capital

Financial Capital

Built Capital

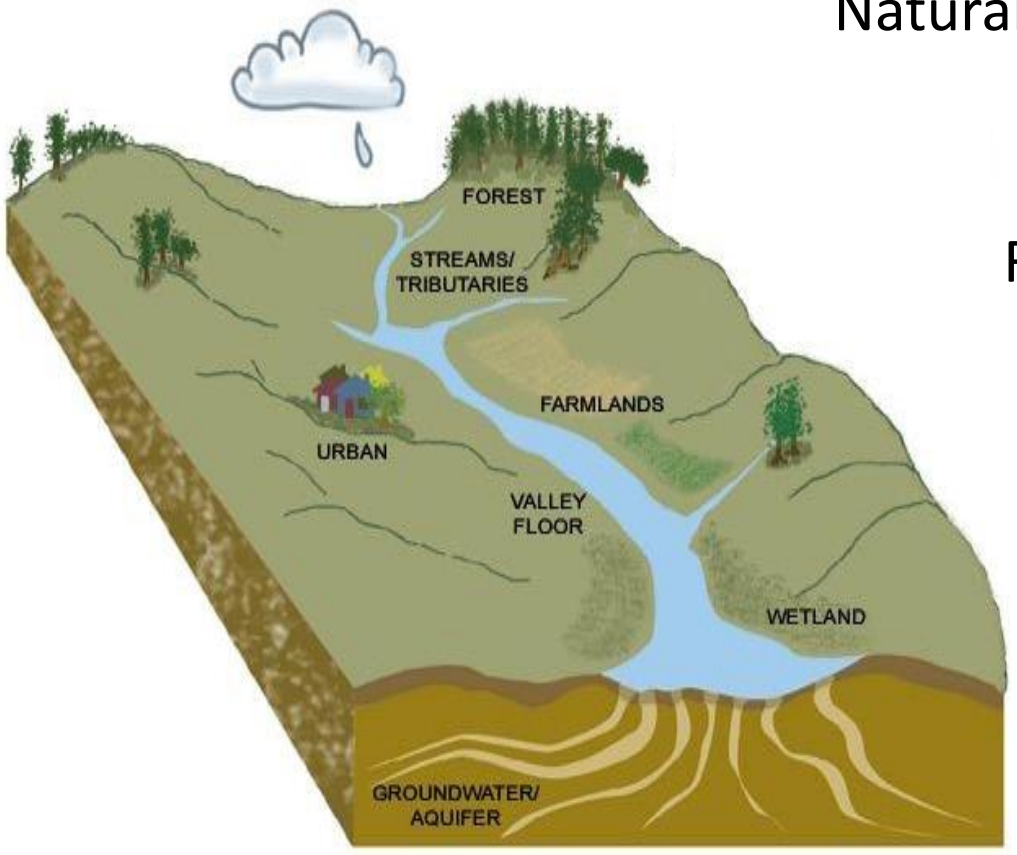
Social Capital

Human Capital

Natural Capital

Ecosystem Services

The benefits people derive from nature



Natural Capital Asset: Watershed

Function: Collection & Filtration

Service: Water Supply

Types of Maps

- ✓Provisioning
- ✓Beneficiaries
- ✓Impairments

Water Supply
Cultural Value
Waste treatment/removal
Flood protection
Coastal flood protection
Aesthetic value
Sediment flows
Wildlife/biodiversity
Recreation
Over consumption
Sewerage
Salinization
Water pollution
Impervious surfaces

Goods Provisioning

Water Supply

Food

Timber

Fuel

Fiber

Medicinal Resources

Regulating Services

Flood Protection

Water Quality/Filtration

Water Temperature

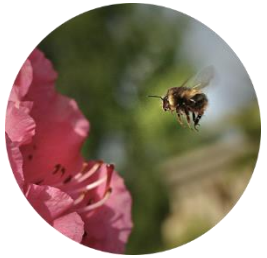
Hydrological Functions

Soil Erosion Control

Gas & Climate Stability

Biological Control

Soil Formation



Supporting Services

Biodiversity and Habitat

Nutrient Cycling

Pollination

Net Primary Production

Cultural Services

Aesthetic

Recreation

Spiritual & historic

Science & education

Conventional Framework

ENVIRONMENT

FLOOD MITIGATION

+

ECONOMY

CAPITAL INVESTMENT

OPERATIONAL COSTS

Flood Protection

LA River | Los Angeles, CA

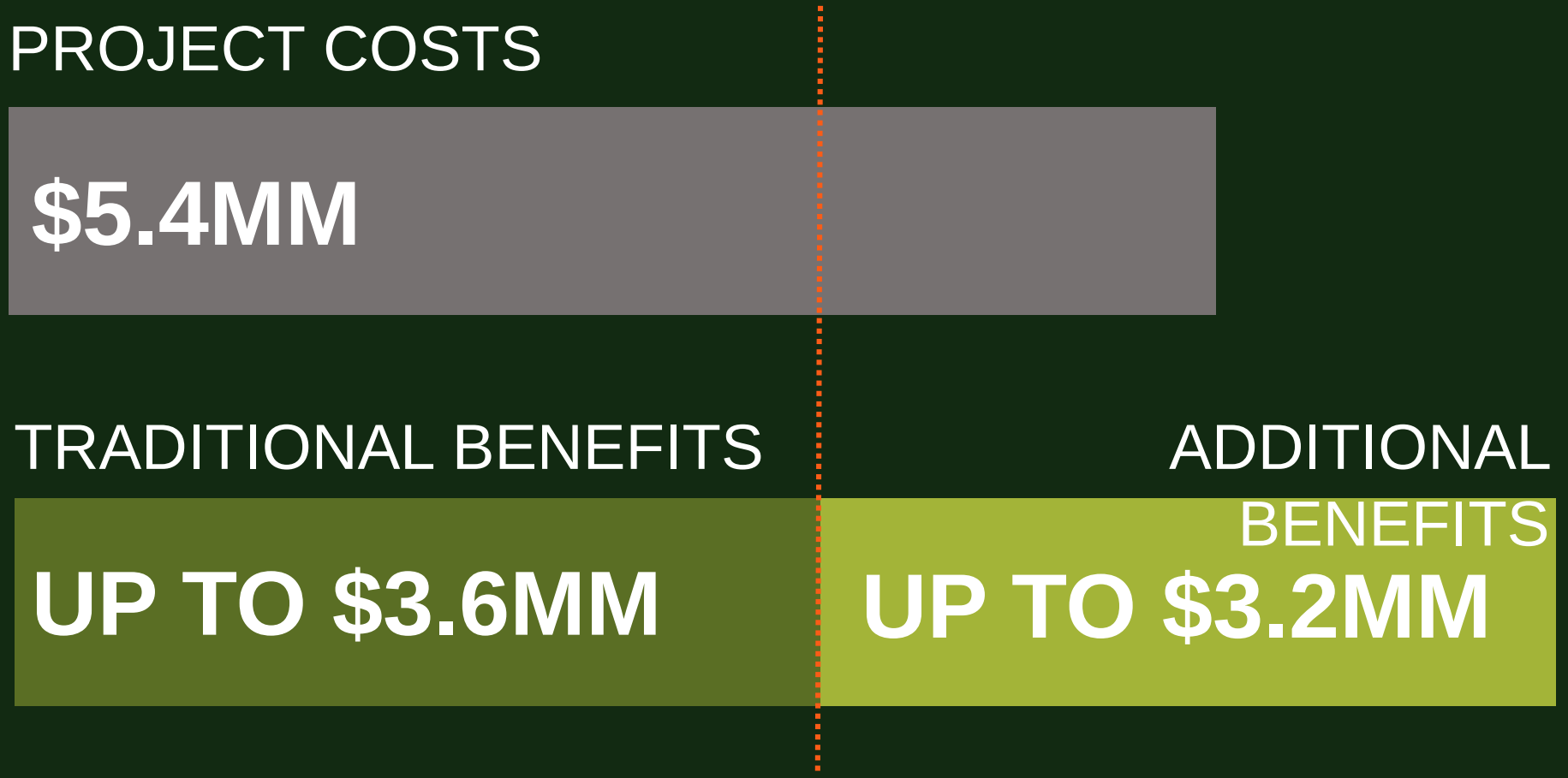
Holistic Analysis

ENVIRONMENT	SOCIETY	ECONOMY
FLOOD MITIGATION	CLIMATE RESILIENCE	CAPITAL INVESTMENT
SALMON HABITAT	EQUITY	OPERATIONAL COSTS
WATER QUALITY	PUBLIC HEALTH	JOBS
WATER SUPPLY	RECREATION	PROPERTY VALUES
AIR QUALITY	SOCIAL COHESION	AVOIDED DAMAGES

Flood Protection+

Thornton Creek| Seattle, WA

Including ecosystem services and other co-benefits nearly doubled the total benefit amount.



Financing Solutions

Financing and Partners are Driven by Co-Benefits

Co-Benefit		Partner
Disaster Risk Reduction	→	FEMA; Pre-Disaster Mitigation Grant Program; Insurance Industry
Water Quality & Supply	→	Local Rates; GASB 62 & Green Bond Financing; Power company
Economic Uplift and Community Development	→	HUD; Foundation PRIs
Carbon Sequestration	→	AB32

FEMA

MITIGATION POLICY – FP-108-024-01

I. TITLE:

Consideration of Environmental Benefits in the Evaluation of Acquisition Projects under the Hazard Mitigation Assistance (HMA) Programs

II. DATE OF ISSUANCE:

JUN 18 2013

III. POLICY STATEMENT:

FEMA will allow the inclusion of environmental benefits in benefit-cost analyses (BCA) to determine cost effectiveness of acquisition projects.

IV. PURPOSE:

The purpose of this policy is to identify and quantify the types of environmental benefits that FEMA will consider in the BCA for acquisition projects.

FEMA

MITIGATION POLICY – FP-108-024-01

Table I shows the types and values of environmental benefits included in the BCA for acquisition-demolition or acquisition-relocation projects:

Table I: Annual Estimated Monetary Benefits per Acre per Year

Environmental Benefit	Green Open Space	Riparian
Aesthetic Value	$1,623	$582
Air Quality	$204	$215
Biological Control	--	$164
Climate Regulation	$13	$204
Erosion Control	$65	$11,447
Flood Hazard Reduction	--	$4,007
Food Provisioning	--	$609
Habitat	--	$835
Pollination	$290	--
Recreation/Tourism	$5,365	$15,178
Storm Water Retention	$293	--
Water Filtration	--	$4,252
Total Estimated Benefits	$7,853	$37,493

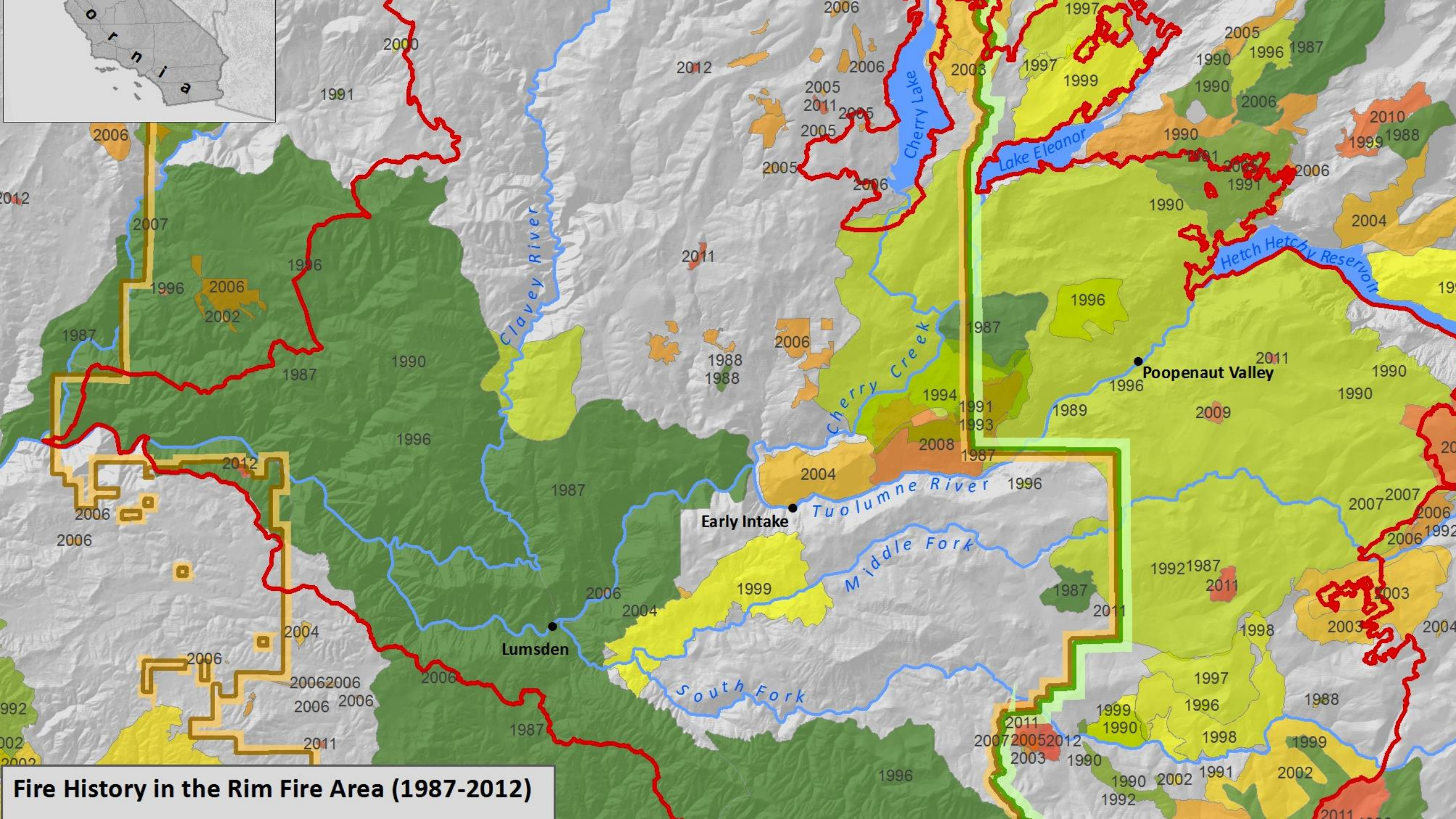
Table II shows total estimated benefits per acre per year and the total estimated benefits per-square-foot for green open space and riparian land use; the benefits can accrue for any lot size.

EARTH ECONOMICS

Tom Meyer / www.meyertoons.com

Rim Fire Damages: Environmental Benefits

TABLE 21	TOTAL RIM FIRE FIRST-YEAR ECOSYSTEM SERVICE VALUES LOST BY LAND COVER	
Land Cover	Low	High
Grassland	$30,569,395	$69,202,212
Herbaceous Wetland	$515,158	$20,284,851
Lake	$93,926	$2,877,038
Riparian	$47,071	$325,824
River	$4,073	$907,523
Shrub	$541,959	$37,247,933
Forest Broad Leaf	$5,098,191	$284,804,356
Forest Coniferous	$63,147,300	$320,363,902
	$100,017,074	*$736,013,639*



Fire History in the Rim Fire Area (1987-2012)


COMMUNITY
PLANNING
&
DEVELOPMENT
National
Disaster Resilience
Competition
CDBG-NDR
U.S. Department of Housing and Urban Development

U.S. Department of Homeland Security
Washington, DC 20472

FEMA

May 12, 2016

MEMORANDUM FOR: Mitigation Division Directors
FEMA Regions I-X

FROM: Michael M. Grimm
Assistant Administrator for Mitigation
Federal Insurance and Mitigation Administration

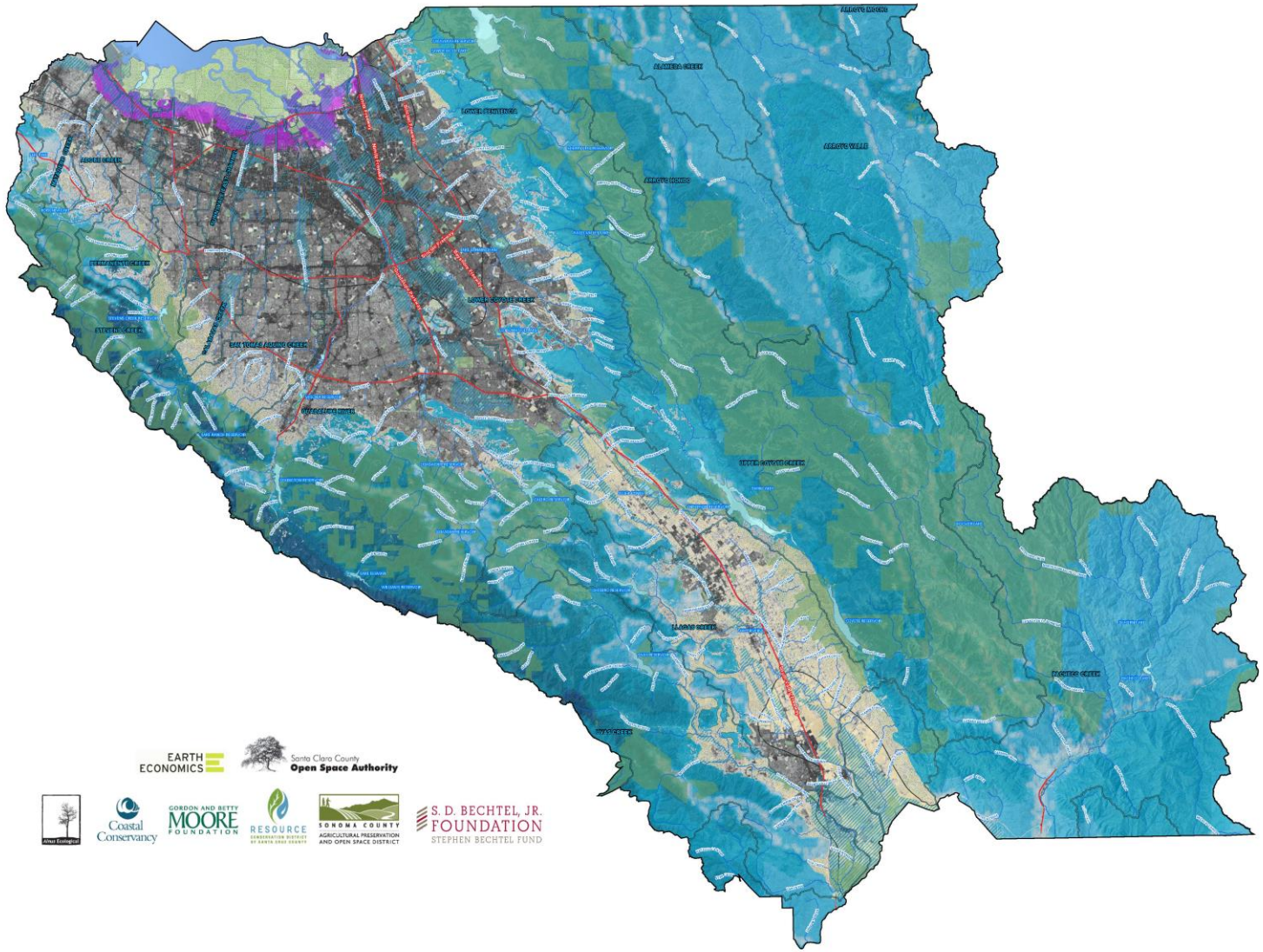
SUBJECT: Benefit Cost Analysis Tools for Drought, Ecosystem Services, and Post-Wildfire Mitigation for Hazard Mitigation Assistance

In September 2015, FEMA released three new activities eligible for the Hazard Mitigation Assistance (HMA) programs: Aquifer Storage and Recovery, Floodplain and Stream Restoration, and Flood Diversion and Storage, known as the Climate Resilient Mitigation Activities (CRMA). These activities can be used for any hazard when appropriate and leverage traditional risk reduction benefits and applicable ecosystem services. Additionally, FEMA developed pre-calculated benefits for cost effectiveness evaluation of soil stabilization, flood diversion, and reforestation projects in wildfire impacted areas to support expedient implementation of post-wildfire mitigation actions. With this memorandum, FEMA is releasing the following additions


Vanore Rd


OFF THE BURN
IT'S NATURE'S TURN
OJAI VALLEY LAND CONSERVANCY

Healthy Lands & Healthy Communities - DRAFT



Legend

- Stream
- Highway
- Watershed Boundary
- Protected Lands (Fee/Easement)
- 100-yr Floodzone
- Confined Groundwater Basin
- Unconfined Groundwater Basin Recharge Area
- Diked Bayland
- 5' Sea Level Rise Storm Surge Inundation Zone

Urban

100
Impervious Surface (%)
0

Groundwater Recharge

16
Average Annual Recharge Below Root zone (in)
0

Miles
0 2.5 5

EARTH ECONOMICS

Santa Clara County Open Space Authority

Coastal Conservancy

GORDON AND BETTY MOORE FOUNDATION

RESOURCE CONSERVATION DISTRICT OF SANTA CRUZ COUNTY

SONOMA COUNTY AGRICULTURAL PRESERVATION AND OPEN SPACE DISTRICT

S. D. BECHTEL, JR. FOUNDATION
STEPHEN BECHTEL FUND

Data Sources: NAIP 2012 Aerial Orthoimagery, USGS (Flint Et. Al. 2010) Cal-BCM groundwater recharge, USGS (Knowles 2010) Potential Sea-level Rise, SFEI Baylands, Open Street Map 2010, SCVWD 1% Floodzones, SCVWD groundwater sub-basins, NLCD 2006, SCVWD & NHD watershed boundary and stream layers, SCC Parks Protected Lands.

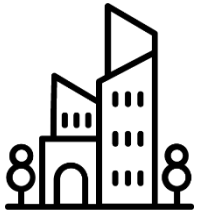
Measure Q: $120 million

New Partners: Healthcare

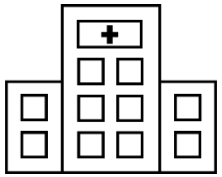
Outcomes for asthma; 100 units over 10 years

Housing Intervention

	Outcome	Monetizable Benefits
Medical Visits	1000 fewer visits	**$95,000 in out-of-pocket**
Missed Work Wages	1040 fewer days	**$270,000 earned**
Disutility	18,000 fewer days with symptoms	**$1.3M WTP**



Medicaid ED Visits	670 fewer ED visits	**$290,000 savings**
Employment Productivity	1040 productive days	**$165,000 in production**
School District Cost	1020 fewer days missed	**$27,000 school funds**

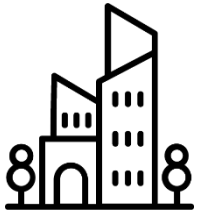


Medicaid ED Visits	670 fewer visits	**$195,000 avoided loss**
Child Hospitalizations	45 fewer visits	**$203,000 avoided cost**
Length of Stay	54 fewer days hospitalized	**$65,000 cost savings**

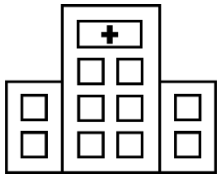
Outcomes from affordability and increased stability of housing
100 units over 10 years

Housing Intervention

	Outcome	Monetizable Benefits
Rent Alleviation	$10 Million	**$800K Expenditures in Hospitals**
Lifetime Income boost	$150K per child	**$15 Million**
Food Quality	$1 Million	**$1 Million**
Child Education Spending	Education for 83 children	**$46,000**



Jobs from Construction	125 jobs/$15M invested	**$1.32 multiplier for output**
Medicaid visits homeless	2925 fewer inpatient visits	**$25 Million**
Taxes	$2.4 Million from expenditures	**$2.4 Million from total expenditures**



Medicaid ED Visits	2475 fewer visits	**$7.2 million**
Community Reputation	5% to 10% appraisal value increase	**$185 million appraisal increase**
Readmission Visits homeless	15% decrease	**Maintain reimbursement**

Accounting: What's the Problem?

Your finance folks tell you that you can only pay for these things **out of annual operating cash…**

…but annual rate revenue is not sufficient to cover large scale investments.

There is an alternative financing choice available that water agencies are often unfamiliar with.

Green Roofs

Stormwater treatment
Lower utility bills
Cooler cities
Cleaner air
Neighborhood beautification

Brooklyn Grange

Green infrastructure: other examples

- **Efficiency Investment Programs**
- **Recycling and Water Reuse Programs**
- **Green Infrastructure and Nature-Based Solutions**

What's the Solution?

What’s the Solution?

GASB 62 says an entity **with rate setting ability** can capitalize ’business-type activity costs’ that would otherwise be expensed.

Implementation guidance will clarify this in April-May 2018.

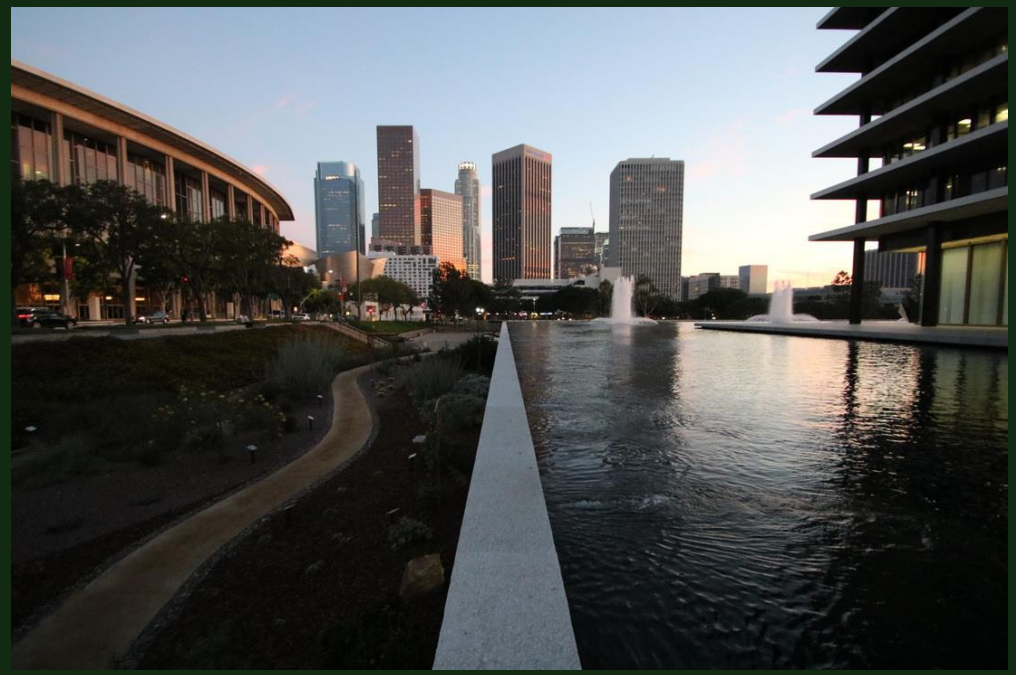
Urban Trees

Stormwater management
Lower asthma rates
Cooler cities
Better quality of life
Walkable cities

OLIN

Who is Doing this Now?

Seattle and King County



Los Angeles


QUESTIONS?
EARTH
ECONOMICS